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A NEW SPECIES OF *OPHIOGOMPHUS* (INSECTA: ODONATA: GOMPHIDAE) FROM THE WESTERN HIGHLAND RIM IN TENNESSEE

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Abstract.—*Ophiogomphus bouchardi,* a new species of Gomphidae, is described from the Western Highland Rim of central Tennessee. The description includes both sexes and the exuviae of the holotype male. Affinities of the new species apparently lie with *O. carolinus* and *O. mainensis*.

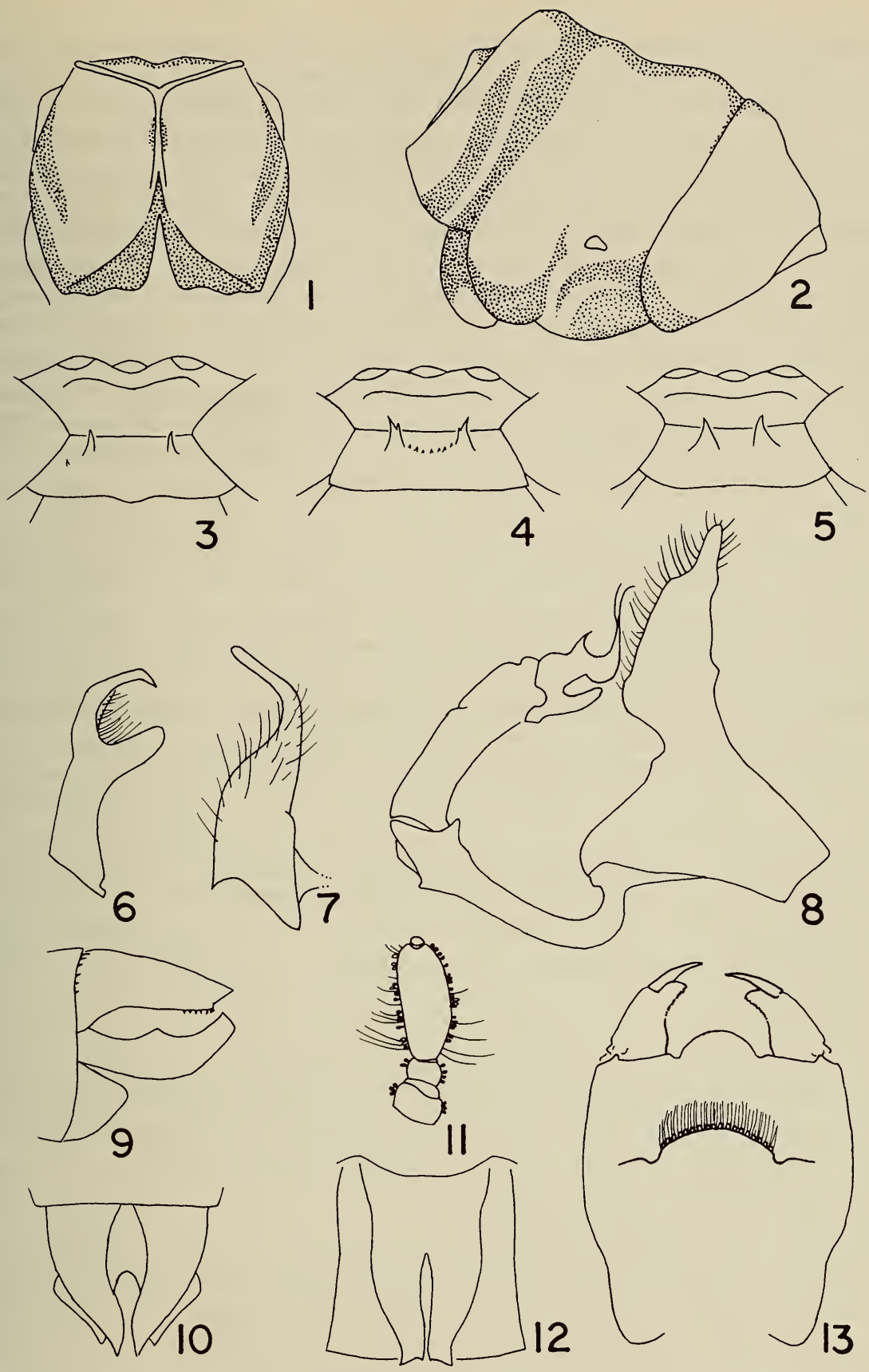
While collecting crayfish on the Western Highland Rim in Dickson Co., Tennessee, in 1971, Dr. Raymond W. Bouchard collected a single female nymph of *Ophiogomphus* which he subsequently succeeded in rearing. The reared female and exuviae were placed in the University of Tennessee collection of aquatic insects (as *O. mainensis*) and there remained until examined by me in 1976. The female and nymphal skin were at once seen to be distinct from other species of the genus by several outstanding characters. I now have a series of seventeen reared adults to support the original supposition of distinctness. Dr. Bouchard has kindly consented to the inclusion of his 1971 collection as part of the type series. It is with great pleasure that I name this new species in recognition of Dr. Bouchard's many contributions to aquatic biology.

Ophiogomphus bouchardi, new species
Figs. 1–13

Material.—Holotype male, TENNESSEE, Dickson Co., Will Hall Creek at U.S. Hwy. 70 (entrance to Montgomery Bell State Park), nymph collected 21 Mar 1981, adult emerged 13 Apr 1981; allotype female, same location and date, adult emerged 14 Apr 1981; paratypes, same location and date, 5 males and 3 females (all reared); same location, 1 female, nymph collected 26 Mar 1971, date adult emerged unknown. Additional material not in type series, same location and date, 3 reared males and 2 reared females; same location, 25 Sep 1980, 5 final instar nymphs; Lewis Co., Little Swan Creek at Natchez Trace Parkway, 20 Mar 1979, 1 final instar nymph. All types will be placed in the Florida State Collection of Arthropods, Gainesville, Florida.

Diagnosis.—Dorsal stripes of synthorax absent or vestigial; face not cross-striped with black at sutures; yellow of tibiae restricted to one-fifth length of tibiae; lateral process of male epiproct not strongly projected; anterior occipital horns of females erect, separated by a distance equal to their height; posterior occipital horns of females vestigial; prementum of nymphs narrowed anteriorly, ligula narrow and strongly projected.

Description of holotype male.—Total length 47.4 mm, abdomen 34.1 mm, hind wing 28.2 mm. Form and coloration generally typical for eastern North American species.



Figs. 1–13. *Ophiogomphus bouchardi,* n. sp.: 1, Dorsum of synthorax of holotype male; 2, Lateral view of synthorax of holotype male; 3–5, Extremes in form of occipital horns of females; 6, Anterior hamule of holotype male; 7, Posterior hamule of holotype male; 8, Penis and vesicle of holotype male; 9, Lateral view of terminal abdominal appendages of holotype male; 10, Dorsal view of terminal abdominal appendages of holotype male; 11, Right antenna of exuviae of holotype male; 12, Ventral view of subgenital plate of allotype female; 13, Prementum of exuviae of holotype male with inset of detail of ligula.

Anterior of frons yellow-green without cross stripes at sutures, dorsum narrowly infuscated with brown between antennal bases, six black granules anterolaterally, entire frons covered with black hairs. Vertex blackish across anterior half, yellowish at hairy prominences, brownish on posterior half. Occiput yellow with dense line of black hairs at crest, scattered black hairs on posterior surface.

Prothorax with two broad longitudinal black bands on dorsum. Synthorax lightly striped with brown; brown stripes adjacent to dorsal crest vestigial, only a faint brown streak adjacent to middle prominence of crest (Fig. 1); second (antehumeral) stripe of thorax present, continuous with brown of katepisternum below, upper end not connected to brown of antealar ridge; stripe of second plural suture (humeral) complete, wider in upper half and constricted somewhat just as it joins antealar ridge; middle suture with faint stripe ending at spiracle; stripe of third pleural suture absent except for faint streak on upper one-third (Fig. 2). Femora greenish; streaked with black that is apically coalesced; tibia and tarsi all black except for small narrow proximal spot of green on outer surface of tibia.

Abdominal segments with dorsal yellow spots, wide on segments two and three, narrowing to segment eight, wider on segments nine and ten; in lateral view abdominal segments dark in upper one-half, gray-green below with black encroaching down into light areas along supplementary transverse carinae and as dark postero-lateral spots; light areas of segments seven to ten tinged with yellow; auricles yellow-green with brownish crescent behind. Male genitalia black-tipped, vesicle shining black; anterior hamule bifid, tip claw-like (Fig. 6); posterior hamule tapering, bent anteriorly forming smooth curve (Fig. 7); penis with moderate flagella (Fig. 8). Terminal abdominal appendages yellow; superior appendages taper to sharp tip, in dorsal view bowed in middle and proximate at bases and tips (Fig. 10), in lateral view appendages arched in middle (Fig. 9), black denticles scattered on ventral surface near tips; inferior appendage bifid to one-half its length, lateral prominences are low tubercles placed near midlength of appendage.

Description of allotype female.—Total length 46.7 mm, abdomen 31.9 mm, hind wing 30.2 mm. Similar in general form and coloration to holotype male except: occiput with pair of large erect sharp-tipped horns separated by distance equal to their length (Fig. 5) and surrounded by black hairs; no vestige of brown stripes adjacent to dorsal crest of synthorax; posterolateral black spots on abdominal segments continue anteriorward as streaks on middle abdominal segments; vulvar lamina as long as ninth abdominal sternite (Fig. 12).

Exuviae of holotype male.—Total length 26.3 mm. Exuviae light brown with coarse pigmented cuticular granules.

Antennae broad and flat, two and one-fourth times longer than wide (Fig. 11). Prementum narrowed anteriorly; palpal lobes short, two-fifths length of prementum and bearing only ten teeth; ligula narrow, less than one-third width of prementum at widest point and bearing 18 teeth and a dense brush of piliform setae on anterior margin (Fig. 13). Lateral spines present on abdominal segments seven to nine, dorsal hooks well developed on segments two to nine, ante-apical tubercles of epiproct located at three-fifths of distance from base to tip.

Variations.—Adult males: total lengths 45.4–50.2 (avg. 48.8) mm, abdominal lengths 31.4–35.3 (avg. 34.1) mm, hind wing lengths 27.0–28.6 (avg. 28.0) mm.

Adult females: total lengths 47.5–51.0 (avg. 48.7) mm, abdominal lengths 33.9–35.8 (avg. 34.7) mm, hind wing lengths 25.8–31.2 (avg. 29.3) mm. Exuviae: total length (both sexes) 24.0–28.0 (avg. 26.4) mm. Above measurements from preserved material. Live final instar nymphs 23–24 mm.

The form and coloration of all adult specimens is generally uniform except that the brown wash adjacent to the dorsal crest of the synthorax is often absent. The occiput of females displays some variation in shape of the posterior outline viewed dorsally often showing a slight convexity or concavity that may be artifactual. The occipital horns display great variability in thickness and position (see Figs. 3–5). In addition, there are often adventitious spinules isolated some distance from the main horns (Fig. 3), as a row between the horns and/or as lateral outgrowths of the large paired horns (Fig. 4).

Relationships.—Relationships among species of *Ophiogomphus* have not been discussed. Species in eastern North America are morphologically distinctive and have highly sympatric distribution areas. Closely related species pairs are uncommon in *Ophiogomphus* unlike many other genera and subgenera of Gomphidae (Louton 1981). Three species of the genus share structural similarities that seem to indicate a close relationship. *Ophiogomphus bouchardi, O. carolinus,* and *O. mainensis* share: 1. similarly structured anterior occipital horns of the female (though those of *O. mainensis* are adjacent), 2. rudimentary posterior occipital horns and 3. terminal abdominal appendages of similar structure (though exaggerated in *O. mainensis*). The close relationship of these three species is further suggested by the allopatric nature of their distributional areas.

The simple matrix below facilitates the separation of the three above mentioned similar species.

	O. bouchardi	*O. carolinus*	*O. mainensis*
Yellow tibial stripe	no[1]	yes	no
Middorsal thoracic stripe	no	yes	yes

[1] Proximal yellow spot about one-fifth length of tibia.

Nymphal habitat.—Nymphs of *Ophiogomphus bouchardi* were found in cherty limestone gravel pockets in a small second order tributary (Will Hall Creek) of the Harpeth River (Cumberland River System). The stream is predominantly bedrock with gravel and sand deposits limited to fissures and pockets in pool areas. Nymphs were also located in sand trapped by the roots of sedges growing where bedrock fissures intersected the streambanks. The most common odonate associates in this habitat were *Stylogomphus albistylus, Boyeria vinosa* and, less commonly, *Gomphus lividus*. All three associates are widespread lotic generalists.

Acknowledgments

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Literature Cited

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Note added to galley proof: After this paper had gone to press, Dr. Minter Westfall (University of Florida, Gainesville) informed me that the forthcoming (December, 1981) issue of Odonatologica contained a description of a new species of *Ophiogomphus* that would be conspecific with the one that I was describing (Carle, F. L. 1981. A new species of *Ophiogomphus* from eastern North America, with a key to the regional species. Odonatologica 10(4):271–278). Mr. Carle submitted his paper October 14, 1981, with the knowledge that I had submitted a description of this same species a month earlier.